still, in the space of sixteen feet—an important consideration where there is any danger of a collision. The patentees feel assured that they will be able to carry passengers at a farthing per mile, and that, too, at a profit."

The inventors declare that they have conquered all the defects which marred the success of their predecessors. In the first place, they have invented a new mode of steering, whereby the steering-wheel is connected with the wheels, and moves them quite independently of the axle on which they turn. The breaking of the steering apparatus, which was a very common occurrence in the carriages where it was connected with the axle, is therefore obviated. Next, the power is said to be applied to the driving-wheels in such a manner that the springs on which the machinery is supported act efficiently in preventing the injurious effects both of vertical and horizontal concussions, whilst the driving-wheels can be made to move at different velocities to facilitate the turning of curves.

Other alleged advantages and improvements are expatiated on, and the patentees are at least as hopeful of success as every successive inventor of similar machines has been since the very outset.

PROGRESS AND PRESENT STATE OF ST. GEORGE'S HALL, LIVERPOOL.

ST. GEORGE'S HALL is still in a very incomplete state. The great hall is as yet a mere shell, and it is believed that several years will yet pass ere all be thoroughly finished. The *system* of the warming and ventilating apparatus would appear to be still in a very uncertain and backward state, as well as the apparatus itself, if the complaints still made in council of doings and undoings, expensive experiments, &c., be well founded. These experiments themselves, it was said, will not cost less than 4,000*l.* to 5,000*l.* Mr. Bennett "hoped than an end would be put to these alterations after alterations. A short time ago he saw the beautiful ceilings of the Law Courts pierced with large holes, and the timber cut in a way which was never intended by the architect. The clerk of the works said this had been done by Dr. Reid's order; and the other day, when he (Mr. Bennett) went through the hall, he found these walls plastered up, the woods put back, and all as before. In different parts of the building there were large holes cut close to arches, and in the vaults of the building there were four enormous steam boilers, 5 feet in diameter, and 15 feet long, and a large engine to work four fans, 5 feet broad and 10 feet in diameter."

A statue of the late Sir R. Peel, in Sicilian marble, is to be placed on a pedestal beneath the eastern portico. It was recommended that fifty or sixty men should be set to work on the building in place of *four or five*, as at present.

For the following general report of progress we are indebted to the local *Times*.

With the general plan of the building the majority of our readers are, doubtless, somewhat familiar, from descriptions previously given; and it will be necessary only to remind them, that in the centre is the great hall, the main entrance to which is from the east; that the *Nisi Prius* is at the northern, and the Crown court at the southern extremity; that the large concert-room extends over the north entrance-hall; that corridors, upper and lower, bound the western side of the structure, communicating with the various rooms to be used in connection with the courts, &c.; and that the grand jury-room occupies the space immediately over the southern entrance-hall. The two courts are in the most forward state, especially the Crown court. Both, though scarcely as large as might have been anticipated, are lofty and well lighted from the roof; the ceilings, which are somewhat elaborately moulded, springing from columns of Aberdeen granite, polished. The capitals of these columns are to be cast in bronze. Each court has an arched opening, supported by columns of gray granite, into the great hall; though, on ordinary occasions, sliding doors will separate the two,—space, however, being left for a gallery at the top, commanding a view of both the courts and the hall. The ceilings of the courts contain, at intervals, iron plates, perforated in the same style as the ornamental work, and painted to imitate it, for purposes of ventilation. The fittings of the courts, which are partially put up, are of oak, plain, neat, and substantial. Gentlemen of the press will have a private mode of ingress and egress.

The grand hall is as yet merely a shell: the floor is not laid: the walls are bare, and the ceiling in an embryo state. The pillars of Aberdeen granite, twenty-four in number, which rear themselves gigantically to the roof, alone have approached completion, though the capitals of these, which are to be of bronze too, are wanting. The pillars, for protection, are encased in wood, so that only at intervals their brilliant surface can be discerned. The floor of the hall is to be laid with Yorkshire flags, like the corridors and entrances. The height and vastness of this central hall impart to it an imposing character, which few buildings of modern times possess; and the impression of its vastness is considerably enhanced from the circumstance of the area being quite clear of central columns. It will be lighted by side branches. The roof is of perforated tiles, which are considerably lighter than bricks. Along the western side, between the pillars, and approached from the upper corridors, will be a series of galleries, whence a view and an audience can be obtained of proceedings within the hall. The large semicircular openings at the northern and southern extremities, near the roof, are to be fitted with ornamental iron work.

The concert-room is slightly in advance, with regard to completion, of the great hall, though only as far as the ceiling is concerned. The eastern front, with its noble portico, its range of sixteen pillars, and its triple flight of steps, upwards of 200 feet in length at the base, now stands fully revealed in all its commanding beauty. Within the colonnade, three on each side the entrance to the great hall, are six lofty pedestals, intended for the reception of statuary.

Standing beneath the southern portico, which leads to the Crown Court, a fine view is obtained of the circumjacent streets, the effect, indeed, from the great elevation, being almost panoramic. The basement story, though less complete even than the other portions of the building, is yet sufficiently finished to give the visitor an idea of the purposes and adaptations of this nether world. During the last few months the hall has been visited by large numbers of foreigners, as well as of townspeople, during the hours set apart for the admission of strangers. From the present state of the interior, the structure, we believe, cannot be completed thoroughly in less than two years.

Books.

A Treatise on the Strength of Timber, Cast and Malleable Iron, and other Materials. By PETER BARLOW, F.R.S. A new edition. London: John Weale. 1851.

MR. BARLOW'S valuable treatise has been revised and corrected by Mr. Heather, M.A., of the Military Academy, Woolwich, and is now published with the addition of an Essay on the effects produced by causing weights to travel over elastic bars, by Professor Willis—an essay which originally appeared in the report of the commissioners appointed to inquire into the application of iron to railway structures. The latter is an important contribution to the stock of knowledge, so far as it goes, and leads us to regret that the commissioners did not completely fulfil the purpose for which they were appointed.

Mr. Barlow's work may be usefully studied by every engineer and architect. It is too well known to need description (having already passed through five editions): we may briefly say, however, that the first subject treated of is the strength of direct cohesion of the fibres of timber, with an account of the experiments of Musschenbroeck, Du Hamel, Emerson, and others; and lastly, of those made by the author, with a description of the apparatus by which the results were obtained.

The next division treats of the mechanism of the transverse strain to which timber and other materials are exposed when loaded in any part of their length, and the mechanical action of the fibres to resist this strain. The laws of deflections under all the varieties of position and fixing to which timber and iron are subjected in architectural and other constructions are investigated, and the author then proceeds to a detail of various experiments by Buffon, Girard, Beaufoy, &c., on the transverse strength of timber; and lastly, the original experiments of the author, which laid the foundation of the first edition, and on which is founded the Table of Data adopted in the subsequent part of this division of the work. Another section is employed in the detail of experiments on bent timber, as used in ship-building,—on the effect of boiling and steaming timber,—experiments by Girard on vertical pressure, and a series of illustrative problems and examples. A short chapter follows on the strength of cement and building materials, as stone, brick, &c., and on the subject of revetment walls.

The next division treats on the direct strength of cast iron and its application in the construction of hydrostatic presses; also on the direct strength of copper, brass, &c.

The following chapter treats on the transverse strength and deflection of cast-iron beams under a great diversity of forms, and on malleable iron.

A detail of experiments is then given on the strength of direct cohesion of iron bars and bolts, and the application of malleable iron to the purposes of railway bars, being the substance of two reports by the author, addressed to the Directors of the London and Birmingham Railway Company, with the addition of several subsequent experiments on railway bars of various forms and dimensions, and of miscellaneous experiments on the effect of locomotive engines and trains on the bars of the Liverpool and Manchester line.

Two Lectures on the Construction of Boilers and on Boiler Explosions; also, a Paper on the Consumption of Fuel and Prevention of Smoke. By WILLIAM FAIRBAIRN, C.E., F.R.S. London: Simpkin, Marshall, and Co.; and Weale, Holborn. 1851.

ANYTHING that Mr. Fairbairn may say on such subjects is entitled to respectful consideration. The first two lectures, on boilers, were delivered before the Leeds Mechanics' Institution, in April last, at the request of the committee, and are by them now published, along with the Paper on Fuel and Smoke, which was originally written some years since, and read before the British Association.

In reference to the construction of boilers, Mr. Fairbairn says, by way of summary, at the conclusion of one of his lectures:—

"In conclusion, I have to recommend attention to a few simple rules, which, if carefully observed, will lead to the most satisfactory results. To construct boilers as nearly as possible of maximum strength, I have already observed they should be of the cylindrical form; and where flat ends are used they should be composed of plates one-half thicker than those which form the circumference. The flues, if two in number, to be of the same thickness as the exterior shell; and the flat ends to be carefully stayed with gussets of triangular plates and angle-iron, firmly connecting them with the circumference. The use of gussets I earnestly recommend, as being infinitely superior to, and more certain in their action and retaining powers than stay rods. Gussets, when used, should be placed in lines diverging from the centre of the boiler, and made as long as the position of the flues and other circumstances in the construction will admit. They are of great value in retaining the ends in shape, and may safely be relied upon as imparting an equality of strength to every part of the structure. With these observations, I would direct attention to the facts I have endeavoured to inculcate."

In like manner, as regards explosions, he concludes that—

"1st. To avoid explosions from internal pressure, cylindrical boilers of maximum form and strength must be used, including all the necessary appendages of safety-valves, &c.

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